



FOREST PEST MANAGEMENT

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EVALUATION OF HAZARDOUS TREES AND PEST-CAUSED TREE MORTALITY, MONTEREY RANGER DISTRICT, LOS PADRES NATIONAL FOREST

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ABSTRACT

Large and potentially hazardous hardwood trees are present at Nacimiento Station. A variety of situations involving bark beetles, root diseases, dwarf mistletoe, and competition for moisture were evaluated in selected stands in the Northcoast and Southcoast areas. The effects of these pests could be reduced by timely and specific vegetation management techniques.

INTRODUCTION

Land management objectives for the Southcoast area of the Monterey Ranger District include emphasis on dispersed recreation, fuelwood production, fuels management to reduce wildfire risks, and maintenance of the visual resource. Silvicultural prescriptions are being developed to bring the area under systematic management. The area has a history of recurring tree mortality. Heavy mortality occurred during and after the 1976-77 drought. Chronic mortality from pine engraver beetles and suspected root disease problems caused District Ranger David R. Harmer to request an evaluation of the area.

On March 29, 1983 we were accompanied by Paul Thomas and Resource Officer Gene Onken when we examined three situations in the Southcoast area of the District. We looked at hazardous trees at Nacimiento Station and pest problems on Prewitt Ridge and Plaskett Ridge. On March 30, we examined pest-caused mortality near Timber Top on the Northcoast area of the District with Paul, Gene, and Joan Brandoff-Kerr.

NACIMIENTO STATION

OBSERVATIONS AND DISCUSSION

Most of the trees in the immediate vicinity of the barracks at the Station are hardwoods such as coast live oak, tanoak and madrone. A 22 inch diameter oak near the barracks fell last winter. The tree collapsed because 1/3 to 1/2 of the tree's circumference at the base was decayed down to the roots. A large basal scar was probably the entry point for the decay.

Five hardwoods around the barracks are potentially hazardous. All of the trees are quite large - each typically about 40 inches dbh and 80 feet tall. When earth was excavated to construct the barracks, the roots of three large trees were severed on the downhill side. All three trees lean toward the barracks, have large dead branches, and have basal scars with associated butt rot. One of these trees is a 40 inch dbh oak with only a 2 inch cylinder of sound wood for support. This is generally considered inadequate for reliable support of a tree that large. Another oak in front of the barracks has basal scars, butt rot and a pronounced lean away from the barracks. It leans toward the proposed site for a garage. Many of the madrones in the area have dead branches caused by a canker disease.

Four conditions must exist before a tree can be considered hazardous:

1. There must be a potential for the tree to fail.
2. There must be a target for the tree.
3. The tree must be capable of damaging the target.
4. The target must be of value.

The most difficult condition to determine is the potential for the tree to fail. The types of defects that would increase the probability of failure of a hardwood include severed roots, root rot, heart rot, splits in the butt or bole, splits at the junction of forks, dead limbs with decay or cracks and leaning trees. Multiple defects usually weaken the tree more than a single defect. As a group, the oaks account for more accidents in California than any other tree and limb failure is the most common source.

A hazard inspection of each tree in the Station area is necessary before any of the management alternatives discussed below can be chosen. The objective of an inspection is to determine which trees have a high probability of failure before the next inspection. The time between inspections is partly determined by the value of the targets. In most situations, annual inspections appear appropriate. A copy of the 1963 publication by Willis Wagener entitled "Judging hazard from native trees in California recreation areas" is enclosed to aid in assessing the potential hazard of trees at the Station.

MANAGEMENT ALTERNATIVES

1. Do Nothing. Several of the trees behind the barracks have a high probability of failure due to multiple defects. The direction of lean, direction of prevailing wind, side of the trees with severed roots, and size of the trees makes the barracks a likely target. With the passage of time it is probable that one or more trees will extensively damage the barracks. Failures are most common during the winter due to high wind and/or wet soil. The season of failure may influence the likelihood of personal injury or fatalities, depending on the proportion of time the barracks are occupied. The do nothing alternative carries the highest risk for an accident to occur.
2. Move the target. Although the trees behind the barracks would cease to be a threat if the building was moved about 85 feet, it may be unreasonable to incur the expense to save three trees which are in a state of declining vigor. This option might be considered, however, for future construction projects such as the proposed garage at the Station.
3. Prune dead, dying and defective branches which present a hazard. Recently dead branches which have not begun to decay or crack are no more hazardous than a live branch. It may be easier and safer, however, to remove them before they deteriorate. Live or dead branches with internal decay evident in old pruning scars or branch stubs generally have a greater probability of failure than undecayed branches.
4. Remove hazardous trees. It would require considerable input of time and money to remove the hazardous trees because of their large size and location. It seems logical, however, that the expenditure would be less than the amount necessary to repair buildings, replace vehicles, or settle lawsuits in the event of a failure.

SOUTHCOAST AREA

The vegetation on the ridges is ponderosa pine, Coulter pine, madrone, tanoak and live oak. There is some coast redwood in the creek bottoms. Persistant pine mortality has occurred in the area, and there were some direct control projects to suppress bark beetles between 1963 and 1970. Some areas where roads run along ridge tops are currently being converted to shaded fuel breaks.

OBSERVATIONS AND DISCUSSION

Two areas where a large number of pine had been cut in the past were confirmed as annosus root disease centers, caused by Fomes annosus. This fungus produces spores in conks that form inside decayed stumps. Wind-carried spores can germinate on freshly cut stump tops, grow down into the roots, and spread to healthy pines across root grafts or contacts. One disease center at Chalk Peak contained 8 stumps. The majority of the trees died between 1976 and 1979. Pine occurs as single trees or small aggregations in the immediate vicinity. There is only

one Coulter pine still alive on the perimeter of the aggregation containing the root disease center. This center will probably die out eventually due to lack of hosts; however, experience from other areas in California indicate that such centers, although not enlarging, will not support any pine regeneration for several decades. A second annosus root disease center was identified at Plaskett Ridge, where a large number of stumps had resulted from salvage following a fire. Many of the stumps contained conks of Fomes annosus. Naturally regenerated 3 to 7 year old ponderosa pine were present around the stumps. No mortality of pine seedlings or saplings was visible, but their small root systems may not yet have reached the root mass of infected stumps. This center also may remain active for some time because hosts are present in and around it.

No attempt was made to systematically survey the Southcoast Ridge area for annosus root disease centers. Circumstantial evidence such as the presence of hosts, inoculum and disease centers, as well as knowledge that cutting has occurred in the past make it likely that other centers exist. A conservative approach would include having District personnel examine all tree mortality centers for which prescriptions are being prepared and determine if annosus root disease is present. This would provide biological input to aid in selecting the treatments best suited for the affected aggregations.

Current and older pine mortality was present at several other spots on Prewitt and Plaskett Ridges. The immediate cause of mortality was a combination of pine engraver beetles, Ips spp., and the western pine beetle, Dendroctonus brevicomis. Pines that had been top-killed by pine engraver beetles were common.

There were several conditions present that probably predisposed the trees to beetle attack. The soil was rather shallow and rocky at some points along the ridgetops. Low available water can stress trees and make them more susceptible to beetle attack. The amount and distribution of vegetation in the area probably contributed to moisture stress. Pines tended to occur in clumps with basal areas up to 180 square feet per acre. The conifer stocking is probably not excessive by itself, but grass, brush and hardwoods add to the competition. Some trees in the area are not well suited to withstand competition due to their present condition. Site conditions, past competition and old age have produced visible signs of declining vigor, such as flat-topped crowns, reduced needle complement and short, off-color foliage. Such trees have a high risk of being attacked by bark beetles during a future period of stress, such as drought. Because many of the major bark beetles have pheromones which aggregate beetles near a successfully attacked tree, it is likely that some relatively healthy trees adjacent to high risk trees could be killed. Removing green high risk trees may prevent future mortality by acting as a light thinning and also by eliminating the potential center of a bark beetle mortality spot.

Another reason for chronic mortality in the area is a persistently high level of pine engraver beetles. Winter storms regularly cause breakage and windthrow of pines along ridgetops. Trees blocking roads are often cut by the District or forest visitors to gain access. Cut and broken

pine slash is rarely removed because there are no readily accessible markets and the local fuelwood cutters prefer hardwood. Green pine slash, cull logs and windthrown trees larger than 3 inches in diameter are particularly effective in maintaining high pine engraver beetle populations during spring. The population that emerges in spring is usually small because of natural mortality that occurs during the winter. Also some emerging adults are lost due to turbulent spring weather. Standing live host material available to the survivors is generally vigorous due to winter precipitation. Therefore, fresh pine slash is more readily attacked and breeding success is often high. Beetles then begin to emerge from slash infested in the spring about the time standing trees undergo moisture stress. Tree mortality and top-killing are often localized near infested slash piles, and can be significant.

Shaded fuel breaks are being installed along ridgeline roads, and about 200 acres per year will be completed over the next 8 to 10 years. Trees are cut and burned in small blocks, which are then planted with ponderosa pine. No current problems were seen but two potential situations are possible.

Pine was cut in some blocks, and, although slash disposal was generally good, a few cull logs with fresh cambium were left. Evidently the logs were supposed to be burned, but the fire only scorched the outer bark. Pine engravers can successfully breed in pine logs with green cambium of any size over 3 inches in diameter. Fire can be used to make green pine slash unsuitable for breeding by these beetles. The entire outer bark does not have to be consumed, but the phloem area should be heated enough to "cook", or turn color.

Tanoak, madrone and oak were also cut in a shaded fuel break that was later planted with pine. In some cases, the slash burning was hot enough to kill hardwood stumps. Armillaria mellea, a root disease fungus, is normally present on oak roots. It coexists with the oak as long as the tree remains alive. If, however, the oak roots suddenly die, the fungus can build up on the root mass. There could be some mortality of conifer seedlings planted in the immediate vicinity of an oak stump beginning in about 5 years. We cannot predict how much conifer seedling mortality will be caused by A. mellea. There are, however, several generalizations we can make that should apply to the situation on the District.

1. All killed hardwoods can be colonized by A. mellea, but oaks provide the best food bases that may lead to conifer mortality.
2. Keeping hardwoods alive or allowing cut hardwoods to sprout tends to reduce the probability of seedling losses.
3. As the number of hardwoods killed per unit area increases so does the likelihood of future root disease problems.
4. Mortality from this pathogen is normally confined to the root zone of the hardwood stump, and disease centers do not continue to enlarge for many years as with Fomes annosus.

5. Removing stumps will reduce the probability of future Armillaria root disease-caused mortality.

MANAGEMENT ALTERNATIVES

1. Do Nothing. Pine mortality will continue to occur at a fairly high level. Fuel loads will increase in some places. Some bark beetle-caused mortality spots may not seed back to pine if brush or grass dominate the site. The pine component will probably be reduced, but not eliminated.

2. Emphasize hardwood management. Many of the insect and disease situations encountered seem to be problems only because the management objectives for the area tend to emphasize conifers. If accessible areas were managed for hardwoods and pines were accepted as incidental species to maintain diversity, then *Fomes annosus* root disease, *Armillaria* root disease, pine engraver beetles and western pine beetle would be lesser problems. The amount of effort required for site preparation, thinning and release would probably be much lower for native hardwoods than conifers. Pines would continue to exist in inaccessible areas.

3. Treat existing pine aggregations. Most of the existing pine aggregations would benefit from thinning and control of vegetative competition. In some cases it might be appropriate to remove a few trees from an aggregation which have signs of low vigor using Keen's or Dunning's risk rating systems. This would lower the probability of bark beetle attack on trees within about 20 feet of the high risk tree. High-risk logging of isolated trees will not offer any stand protection. It will increase product value in areas where markets for pine exist by offering green trees rather than salvage.

4. Treat pine slash. The amount of pine mortality and top-killing by pine engravers could probably be lowered by annually treating pine slash and storm breakage during late winter or early spring. It is generally effective to treat slash only in the vicinity of the area where protection is desired, because pine engravers normally do not travel too far between emergence and attack. Chipping all green pine slash over 3 inches diameter would offer the greatest protection against infestation and would probably also improve the fuels situation. Other techniques, listed in order of decreasing effectiveness, include burning pine slash while green, mechanical crushing and debarking with heavy equipment, and lopping and scattering slash in sunny locations. Distributing a concise factsheet about pine engraver beetles and slash treatment to fuelwood cutters, ORV groups and fire crews may lower the amount of green pine slash piled near roads.

5. Reduce the impact of *Fomes annosus*. The District routinely treats stumps with borax to prevent the start of new root disease centers. Positive confirmation of *F. annosus* in several locations on the District certainly underscores the importance of continuing this procedure.

a) Stump and root removal. Removing as much stump and root material as possible will eliminate the underground means of root disease spread. After the fine roots that remain in the soil have been decayed, the site will be suitable for conifer regeneration. Recently cut stumps can be pushed or pulled out, but rotten stumps would have to be removed by excavation or complete burning. The effectiveness of this method depends on how much root material is removed.

b) Stump fumigation. Root disease fungi have been eradicated from infested stumps by fumigation. This technique, however, has not been tried with Fomes annosus in California, and application of the procedure would have to be considered as a pilot test.

NORTHCOAST AREA

Much of the Northcoast area of the District is included in the Ventana Wilderness. Road 20S05 offers administrative access to the areas bordering the Wilderness, but is closed to public vehicular use. Much of the slope facing the ocean is covered with grass or brush and has been extensively grazed. The ridgetop that Road 20S05 follows supports stands of ponderosa pine, Coulter pine, incense-cedar, madrone and oak. The 1977 Marble Cone fire burned most of the Wilderness and some adjacent areas.

OBSERVATIONS AND DISCUSSION

The ponderosa pine in the ridgetop stands examined are generally medium to large size sawtimber, up to about 180 years old. A long history of fire exclusion allowed the development of a dense understory of oak, madrone and Ceanothus. Western dwarf mistletoe, Arceuthobium campylopodum, occurs in pockets on ponderosa and Coulter pine. Many trees have dwarf mistletoe ratings of 5 or 6 (considered severe) on the 6-point Hawksworth rating system. Road 20S05 is generally the boundary of the Marble Cone fire. Some trees on the ridgetop were killed directly by the fire. Mortality has continued since 1977, probably because trees were still under stress from a combination of factors, including the 1975-77 drought, injury from the 1977 fire and moisture stress from dwarf mistletoe and competition with hardwoods and brush. Continued mortality has caused large openings in the stand, which seems to have contributed to winter storm breakage and blowdown. A continual supply of fresh pine slash during spring has maintained a high population of pine engraver beetles and contributed to top killing and mortality.

MANAGEMENT ALTERNATIVES

1. Do Nothing. Brush and hardwoods have prevented the establishment of pine reproduction and the overstory is decadent. If fire is excluded, the stand will probably convert to hardwoods and brush. Fire would prepare an excellent seedbed, but the accumulation of live and dead fuels

is so large that a burn would probably eliminate the remaining pine seed source. The Marble Cone burn has already eliminated a large portion of the pine in Seed Zone 120.

2. Reduce competition. The lifespan of overstory pines could probably be extended by reducing competition from hardwoods and brush. Hand cutting and herbicides appear to be feasible in the area. Prescribed fire is liable to cause severe damage unless extensive prework is done. If the reduction of brush and hardwoods allows pine to seed in, the pine may become infected by dwarf mistletoe seeds from the overstory trees.

3. Control dwarf mistletoe and regenerate aggregations. It would probably not be feasible to eradicate dwarf mistletoe in the area, but it could be controlled. Dwarf mistletoe infection levels in the area could easily be manipulated by silvicultural methods because it tends to occur in discrete pockets. The ultimate goal of improving general stand vigor and perpetuating pines in the area would require removal of severely infected overstory trees and regeneration of replacement trees. This can be accomplished by a number of methods.

A. Infected overstory aggregations could be patch cut and the site could be prepared and planted with stock grown from local seed.

B. Before planting the infected overstory could be girdled or killed by herbicide injection and left for wildlife trees or dead shade, if it were possible to dispose of the brush.

C. The infected overstory could be left as a shelterwood or as seed trees, providing they were removed or killed before the regeneration was 3 feet tall or 10 years of age. The overstory could be harvested, dropped and left, or girdled while standing.

Regenerating aggregations by methods B and C may initially provide a more favorable microclimate, but are likely to damage some reproduction when the overstory is harvested or eventually falls. Treatment of green pine slash and cull logs would be necessary to prevent a buildup of pine engraver beetles which could threaten adjacent residual pine stands. The young stands which are regenerated are likely to be more resistant to windthrow and storm damage than the current stands. Dwarf mistletoe suppression funding may be available through the FPM Staff if it is impossible to dispose of the overstory by a commercial timber sale.